PHYSICO-CHEMICAL PARAMETERS OF PKM 1 SAPOTA *(Achras zapota L.)* FRUITS

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ABSTRACT

In India, sapota ranks fifth both in production and consumption next to mango, banana, citrus and grapes. Sapota (Manilkara achras L.) is one of the important tropical fruits belonging to the family Sapotaceae. Sapota is a climacteric fruit and is highly appreciated for its pleasant flavour, sweet taste and deep orange red colour of the pulp. The annual post harvest losses of fruits and vegetables is about 25 to 30 per cent due to spoilage, inadequate post harvest handling, lack of processing facilities, transport, storage and marketing. Gopalan et al., (2005) recorded composition of ripened sapota fruit as moisture (73.7 per cent), carbohydrate (21.4 per cent), fibre (2.6 per cent), fat (1.1 per cent), protein (0.7 per cent), mineral (0.5 per cent), Vitamin C (6 mg), thiamine (0.02 mg), riboflavin (0.03 mg), niacin (0.02 mg) and mineral content calcium (28 mg), phosphorus (27 mg) and iron (2 mg). In the present study, Hence, an experiment was undertaken to study the effect of harvest and Ripening stages for analysing physico-chemical parameters of sapota (PKM 1) fruits. From the present study, it is concluded that, physical parameters viz. weight of fruit, pulp, skin and seed, volume of fruit, specific gravity, length and diameter of fruit, fruit colour, juice recovery and pulp: seed ratio and chemical parameters viz. T.S.S., total and reducing sugars, titratable acidity, pH, ascorbic acid, tannins and moisture of sapota fruits could be considered as maturity indices to judge the ripening stages of sapota fruit for various value added products preparation.

Keywords: sapota, nutrient, fruits, harvest

INTRODUCTION:

India is the largest producer of sapota followed by Mexico, Guatemala and Venezuela. Area under sapota in India is estimated to be 1.40 lakh hectares, with an annual production of 11.17 lakh tonnes. Sapota fruit is a good source of sugar which ranges between 12 and 14 per cent. A 100 g of edible portion of fruit contains moisture (73.7 g), carbohydrates (21.49 g), protein (0.7 g), fat (1.1 g), calcium (28 mg), phosphorus (27 mg), Iron (2 mg) and ascorbic acid (6 mg) as reported by Gopalan *et al*., 2005.

REVIEW:

Sapota fruits are used for making jams, jellies, osmodehydrated slices and squash . Products like sweet chutney, dried sapota pieces, sapota milk shake, nectar, blended sapota drinks, pickle, preserve and candy can also be prepared with good sensory quality. Even wine can be prepared from sapota fruit (Koli, 2000).

Ripening stage of fruit affects physico-chemical parameters of fruit which ultimately affects the quality of processed products prepared from them. Hence, an experiment was undertaken to study the effect of harvest and Ripening stages of ripening on physico-chemical parameters of sapota fruits.

MATERIALS AND METHODS:

The present investigation was conducted at the Department of Food Science and Nutrition, Community Science College and Research Institute, Tamil Nadu Agricultural University, Madurai, India, during the years 2017 to 2022. Well matured fruits of uniform medium size of cv. PKM 1 were harvested, washed with tap water and kept in the laboratory at ambient temperature for ripening. Sapota fruits of different stages of ripening *viz.* half ripe and ripe were selected and used for physico-chemical analysis. The experiment was conducted by following complete randomized design with 4 levels of ripening stages with 3 replications. To study the physical characteristics, 10 sapota fruits from each ripening stage were randomly selected and examined individually for various physical parameters. The average of 10 fruits has been reported for each physical parameter. For chemical analysis, edible part of sapota fruit from different ripening stages was taken for estimating various chemical parameters. Moisture and total soluble solids were estimated by the method described by A.O.A.C. (Anon., 1975). However, reducing sugar, total sugar, titratable acidity, ascorbic acid and tannin content were estimated by the methods described by the Ranganna (1977). The pH was measured by using standard solutions of pH 4.0 and 7.0 as reference to calibrate.

RESULT AND DISCUSSION:

It is seen from Table 1 that mature, half ripe, ripe and over ripening stages of sapota fruit had significant influence on physical parameters of sapota fruit, except weight of seed and diameter of fruit.

Weight of fruit and pulp, volume of fruit, length and diameter of fruit, juice recovery and pulp: seed ratio showed decreasing trend from half ripe to ripe stage during ripening of sapota fruit. This decreasing trend obtained during ripening of sapota fruit may be attributed to loss of moisture due to respiration and transpiration during ripening process. The present findings of decreasing trends in weight, volume, length and diameter of fruit are supported by (Mahapatara *et al*., 2012) in karonda fruit and Pawar (2011) in sapota for juice recovery. Minimum weight of skin observed at over ripe stage (5.04g) was the impact of loss of maximum moisture from skin. However, increase in specific gravity of fruits from 1.03 (mature stage) to 1.06 (ripe stage) during ripening indicated that, the decrease in weight of fruit was lesser than the corresponding decrease in its volume. Similar observations have been reported by Brito and Narain (2004) for karonda fruits and Pawar (2011) for sapota fruits. Weight of seed of sapota fruit at different stages of ripening did not show significant difference. Decrease in pulp: seed ratio observed during ripening of sapota fruit may be due to more decrease in weight of pulp as compared to seed. Observation analogous to this finding was reported by Kumbhar *et al.* (2003) and Pawar (2011) in sapota fruits.

It is observed from Table 2 that, all the chemical parameters studied showed significant difference with respect to ripening stages of fruit, except moisture content of fruit. T.S.S., total and reducing sugar content of sapota fruit at different stages of ripening increased significantly from mature 18.40 Brix to ripe stage 23.80 Brix. An increase in T.S.S. and sugars during ripening process in sapota fruit may probably be due to accumulation of more sugars in the fruit due to hydrolysis of starch and slight decline at over ripe stage was due to utilization of sugars during respiration process. The results of this investigation are in agreement with the results obtained Pawar (2011) in sapota fruit.

Decrease in acidity from mature stage (0.24%) to ripe stage (0.17%) observed during ripening may be attributed to the oxidation of organic acids (Pawar (2011). The increase in pH from 5.40 to 6.44 during ripening of sapota fruit may be attributed to the decrease in acidity during ripening. Results of the present study are supported by (Kulkarni *et al.,* 2007) in karonda and Pawar (2011) in sapota fruits.

Ascorbic acid content of sapota fruit declined throughout the ripening process from 20.40 mg/ 100g (mature stage) to 12.04 mg/ 100g (ripe stage) due to oxidative destruction of ascorbicacid by enzymes, mainly ascorbic acid oxidase, during ripening (Pawar (2011)). Identical observations during ripening were also reported by Ajaykumar et al., 2012 and Pawar (2011) in sapota. Sharp decrease in tannins was observed during ripening of sapota fruit. This may be due to the fact that tannins are hydrolyzed into components like sugars, acids and other compounds during ripening and also due to its oxidation by polyphenol oxidase to form colour pigment. Similar results were reported by Pawar (2011) in sapota. The moisture content of sapota fruit decreased continuously from mature (76.30%) to over ripe stage (69.24%). However the results were non-significant. Decline in moisture of sapota fruit during ripening could be attributed to the loss of moisture through respiration and transpiration. Similar findings were also reported by Pawar (2011) in sapota fruits cv. PKM 1.

SUMMARY AND CONCLUSION:

From the present study, it is concluded that, physical parameters *viz.* weight of fruit, pulp, skin and seed, volume of fruit, specific gravity, length and diameter of fruit, fruit colour, juice recovery and pulp: seed ratio and chemical parameters *viz.* T.S.S., total and reducing sugars, titratable acidity, pH, ascorbic acid, tannins and moisture of sapota fruits could be considered as maturity indices to judge the ripening stages of sapota fruit for various value added products preparation.

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Table 1: Effect of different stages of ripening on physical parameters of sapota fruits

Ripening Stage	Weight of fruit (g)	Weight of pulp (g)	Weight of skin (g)	Weight of seed (g)	Volume of fruit (ml)	Specific gravity	Length of fruit (cm)	Diameter of fruit (cm)	Colour	Recovery of juice (%)	Pulp: Seed ratio
R1	93.17	82.38	7.07	1.72	90.20	1.03	6.47	5.34	Yellowish brown	51.24	52.16
R2	90.71	80.54	8.16	1.64	87.23	1.04	5.98	5.21	Light Brown	50.05	48.12
R3	83.34	74.02	8.45	1.73	79.10	1.06	5.47	5.24	Brown	45.84	45.24
R4	61.34	55.16	5.04	1.54	59.80	1.03	5.01	4.94	Dark brown	40.47	37.54
S.Em□	1.57	2.34	0.41	0.17	1.36	0.01	0.21	0.19	-	1.81	2.54
C.D. at 1 %	7.14	9.03	1.63	NS	5.68	0.03	1.04	NS	-	7.39	10.64

R_1 - Mature (harvesting stage) **R_2- Half ripe** **R_3- Ripe** **R_4- Over ripe**

Table 2. Effect of different stages of ripening on chemical composition of sapota fruits

Ripening Stage	T.S.S. (oB)	Total sugars (%)	Reducing sugars (%)	Titratable acidity (%)	pH	Ascorbic acid (mg/100g)	Tannins (%)	Moisture (%)
R1	18.40	15.20	9.20	0.24	5.40	20.40	0.47	76.30
R2	21.20	16.45	9.74	0.21	5.70	15.37	0.31	75.34
R3	23.80	19.17	11.07	0.17	6.17	12.04	0.19	73.14
R4	22.20	17.87	10.04	0.08	6.44	7.87	0.17	69.24
S.Em ±	0.44	0.27	0.08	0.01	0.04	0.13	0.03	3.13
C.D. at 1%	1.83	0.99	0.29	0.07	0.35	0.63	0.06	NS

R_1 - Mature (harvesting stage) **R_2- Half ripe** **R_3- Ripe** **R_4- Over ripe**